Prepared Remarks of
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I would like to extend my thanks to my hosts with SGI for holding this important forum.

In 1999, I made my first visit to Saudi Arabia as Secretary of Energy. The primary purpose of this trip was to encourage Crown Prince Abdullah to open Saudi Arabia's upstream oil and gas fields to foreign investment. Over the course of our visit, we flew to several Aramco facilities. At our first briefing on the tour, we found brochures at our conference table describing Aramco's recent success stories, including how it had, and I quote, "invented" 3-D seismic technologies.

This brochure sent my staff into a flurry of activity, doing a quick review of my luncheon speech to be delivered later that day. Why their concern? Apparently my speech explicitly touted DOE's own success story -- the extensive role of its national laboratories and their supercomputers in developing 3D seismic technologies!

This story – in addition to illustrating that success does, indeed, have many fathers – also makes several more important points about today's oil and gas industry, as well as about certain requirements for its future.

Disputed claims aside, the widespread use of 3-D and now 4-D seismic imaging demonstrates how fundamentally computer technology has altered the face of the oil and gas industry -- moving it from the age of the divining rod to the age of high-tech information. With this fundamental shift comes additional requirements for a specific set of investments, both in new technologies and a work force that can develop and use them.

The story also highlights the importance of government/industry collaborations (which is likely the real story on 3D seismic) in spreading risk, maximizing technology investments, and ensuring that public goods – energy security, and clean, affordable, abundant energy supplies – are addressed through those investments as well.

In addition, it illustrates that investment is key to meeting global demand growth . . . that oil and gas are commodities in a global marketplace . . . and that US technology and intellectual property are currencies that are highly valued in that marketplace.

Finally, the oil and gas industry -- by virtue of its growing reliance on information technologies and computational capabilities -- has a growing stake in the resolution of the broader energy issues of power reliability and quality that are so critical in today's digital economy.

I would like to offer you my perspective on some of these issues from several vantage points . . . as an Energy Secretary during extremely turbulent energy times . . . as an informed observer of the war on terror and its implications for energy security, as well as of the Bush Administration's energy policy and the current energy debate in Congress . . . and with an eye toward future national and international energy markets and issues. Today, I would like to briefly review:

- global oil and gas markets and technology;
- the current energy debate in Congress;
- the geopolitics of oil and increasingly of natural gas;

- technology trends in the oil and gas industries;
- and the broader interests and needs of the oil and gas industry in today's Information Age.

Energy Markets and Energy Policy: Then and Now

Throughout the 1990s there were significant developments in supply side technologies. I have already mentioned 3D and 4D seismic that enabled far greater accuracy and far less environmental damage in energy exploration and production. In addition, the decade witnessed major advances in drilling technologies – polycrystalline drill bits for example – which in turn enabled new, more productive production techniques, such as horizontal drilling. As a result, by the mid-1990s, oil and gas finding costs had plummeted from $15 per barrel to around $4.50.

On the demand side, increased energy efficiency reduced the overall cost of energy to the economy. Distributed generation technologies offered the promise of a paradigm shift in how we generate and transmit electricity. The federal government, in partnership with industry, launched a major program to increase automobile efficiency to 80 miles per gallon.

Energy markets were also restructuring at legal, financial, and regulatory levels. Worldwide, we saw privatization or liberalization of the energy sectors in many countries. In the US, the natural gas market was successfully deregulated and a robust gas derivatives market grew on Wall Street. Twenty-five states restructured their electricity sectors and comprehensive federal restructuring legislation was under active consideration in Congress.

By 1998, when I started as Energy Secretary, the economy was performing at historic levels – 32% real growth since 1990 . . . employment at all time highs . . . energy prices at all time lows . . .and the federal budget in the black for the first time in decades. In turn, this unprecedented growth created enormous energy demand, especially in the US and in OECD Europe. At the same time, Asia was recovering from a deep economic downturn and by 1999, energy consumption in the region began rising sharply.

In spite of these highly positive developments – actually in part because of them – the swings in the boom and bust cycle of world of oil and gas markets were much steeper than previous historical fluctuations.

Those same low energy prices that fueled the economic engine of the late 1990s also decimated the US Oil Patch and other producing regions around the globe -- shutting down exploration and production rigs. . . idling much of the oil and gas workforce . . . siphoning off investment to more profitable sectors such as information technology . . . and devastating the national economies of critical producing nations such as Russia, Saudi Arabia and Venezuela, where state-owned or controlled companies depend on federal revenues for oil and gas development.

Extremely low prices also discouraged investment in necessary infrastructure improvements in all sectors of the energy business, from tankers . . . to pipelines . . . to refineries . . . to storage facilities . . . to transmission lines . . . to power generation.

This takes us to the 2000-2001 timeframe, the years characterized by many energy analysts as "The Perfect Storm." During this period we witnessed:

- very tight energy supplies;
- volatile oil, heating oil, gasoline, natural gas and electricity prices;

- refineries consistently operating at 96% capacity;
- renewed OPEC cohesion;
- periodic Iraqi interruptions of oil exports;
- a drought in the Western US that seriously reduced the availability of hydropower in the region;
- growing unrest in the Middle East with the bombing of the SS Cole and the ever escalating violence after Temple Mount;
- and, the California electricity crisis.

Add the fact that all of this was happening during a Presidential election year, and you have a snapshot of my last full year as Energy Secretary. To borrow a phrase used by Queen Elizabeth a few years back, the year 2000 was in many respects the energy "annum horribilus" – the horrible year.

The Bush Administration now has its own set of energy problems: the war on terror that, by virtue of geography alone, raises issues of energy security…social unrest in the Persian Gulf…a market jittery about Iraq…the recent worldwide economic slowdown . . .the collapse of Enron and its associated fallout . . .a very recent surge in oil prices…and, in spite of the current popularity of the President, the realization in the energy arena, policy progress is both slow and difficult.

This is not surprising. Changes in U.S. energy policy are largely incremental and energy policies from Administration to Administration often look remarkably similar. In spite of some overblown rhetoric, most of the policy recommendations in the Bush energy plan mirror those of the three previous plans released by the Clinton Administration in 1995, 1997 and 2000.

The current energy bills under consideration in Congress exhibit similar cautious approaches to energy policy, with neither the House nor the Senate versions deviating too far from the energy orthodoxy of either political party.

The House has already passed a voluminous energy bill that includes provisions to open up ANWR to oil production…ease production restrictions on other public lands…extend additional royalty relief for offshore production…and provide various tax incentives to increase efficiency, renewables, and domestic oil and gas production.

The energy debate in the Senate is in progress and the ultimate outcome is uncertain. This is what we know as of yesterday.

In general, the Senate bill places greater emphasis on efficiency, conservation and the development of alternative fuels. Like the House version, the Senate bill will likely include tax incentives for oil, gas and renewables. These provisions -- which carry a $13 billion price tag -- are scheduled to be considered at the end of the debate and must be added to the bill by amendment

The Senate bill includes pipeline safety provisions and will likely include some version of electricity restructuring. Neither of these provisions are in the House bill. Major stakeholder groups are, however, unhappy with how the electricity title was added to the Senate bill – a voice vote on an unvetted staff draft. There is, as we speak, a pretty significant effort underway to strip the entire restructuring title from the Senate bill. Particularly grating to many, in light of the Enron fiasco, is the repeal of the Public Utility Holding Company Act –PUHCA -- without commensurate consumer protections.

Also, the bill currently includes no reliability title – this is arguably the most "federal" of all federal responsibilities in the electricity arena. Finally, as of yet, the electricity title includes no renewable portfolio standard.

The Senate, like the House, would mandate the southern route for the Alaska natural gas pipeline, acknowledging that this more costly route will require federal subsidies to be built. The inclusion of pipeline subsidies in the final bill – which must be approved by the Finance Committee --is in doubt. This would be very costly to taxpayers and many independent producers in the lower 48 states resent the leg-up this would give to gas producers in Alaska. The ultimate outcome of a mandated but unsubsidized route could be no pipeline at all.

The Senate bill -- like its House companion -- will not raise CAFÉ standards for autos or SUVs. Finally, while US energy policy has frequently been held hostage to Alaska politics, it appears likely that the Senate bill will move forward without provisions to open ANWR. The environmentalists are strongly opposed, many in the industry are openly expressing disinterest, and without provisions to ban exports of ANWR oil (whose natural markets are Japan and South Korea), it will do little to reduce overall US reliance on imports.

The ultimate resolution of these differences is important. The bill – along with the discretionary choices the Administration will have in its implementation -- will help set the energy policy, technology, and investment course for years to come.

Oil Dependence: Implications for National Security

I would like to take a few minutes to talk about world oil markets, a subject that consumed a great deal of time during my tenure as Energy Secretary. As you know, in addition to technology requirements, there are significant strategic concerns about oil. Let me put these concerns in perspective:

- About 22% of US oil imports are from the Middle East. Compare this to the levels of Persian Gulf imports of key US allies -- 56% for OECD Europe, and 79% for Japan.
- Sixty five percent of the world's oil reserves are in the Persian Gulf. Middle Eastern reserves are seven times larger than the next largest regional reserves in Central and South America; and fifteen times larger than US reserves, which comprise only 6 % of the world total.
- Virtually all of the world's excess productive capacity (idle capacity that can be quickly brought on line in the event of a demand surge or a prolonged supply disruption) is in the Middle East -- and most of that is in Saudi Arabia. Saudi's current production is about 7.1 million barrels per day. Within 90 days, this could increase to 10 million barrels a day, and 10.5 in another 30 days. Saudi Arabia's daily excess capacity exceeds the amount of daily production from any other OPEC country.
- After the collapse of the Soviet Union, Russian oil production declined from 12 million barrels per day to around 6 million. Russian production is now up to over 7 million barrels per day and recently surpassed Saudi Arabia's.
- IEA/OECD nations currently hold 1.3 billion barrels of strategic stocks, with about 570 million in the US Strategic Petroleum Reserve. In the event of a supply disruption, OECD nations could draw down as much as 8 million barrels of oil per day for an extended period of time.

What does this information suggest? First, reliance on Persian Gulf oil will increase sharply over the next two decades but more so in some regions than in others. We can expect increasing ties between Persian Gulf countries and developing Asia.

Also, almost all of the world's excess productive capacity is in the Persian Gulf, extending its strategic reach even further. This is evident in the cautious approach the Bush Administration is taking in the execution of the war. Today's social unrest in the Middle East, relations between the US and Israel, and a Persian Gulf united in its support for the Palestinians, are all complicated by the equally complicated geopolitics of oil.

In addition, tight supplies in the 2000-2001 timeframe enabled OPEC to act more cohesively than in the past, giving it significant influence over the global economy in the last several years. Between 1998 and 2000, OPEC production cuts took oil from $12 per barrel to almost $38. In discussing the global recession last fall, Alan Greenspan acknowledged that he underestimated the impact of high oil prices on the US and world economies, which could have cost the US close to a full percentage point in GDP between 2000-2001.

Also, vehicles, unlike power plants, do not have coal, gas, oil, nuclear or hydro as fuel options and must rely almost exclusively on oil. Increased demand for automobiles, particularly in the developing world, is fueling increased demand for oil. China alone will add 170 million new cars to its roads. Central and South America will see a similar explosion in their per capita vehicle rates. Coupled with growing demand, vehicle fuel inelasticity will further enhance the influence of Persian Gulf producing nations.

Finally, the number of days of import protection that strategic oil stocks provide against supply disruptions has seriously eroded -- while oil consumption has increased, reserve levels have remained constant. Also, many countries in Asia have no strategic reserves even though the region has few indigenous oil resources; this could further strengthen Asia's strategic ties to the Persian Gulf.

Our most potent weapon against supply disruptions is the Strategic Petroleum Reserve. World oil markets have however changed dramatically since the time the SPR -- and definitions for its use -- were established 25 years ago. Today, the threat of extended supply disruptions – absent a complete OPEC embargo, or the total destruction of Saudi and Kuwaiti production capacity in a war with Iraq, for example -- is far less likely than in the past.

Saudi Arabia now has excess capacity sufficient to make up for shortfalls from any other single OPEC nation, and has repeatedly indicated a willingness to exercise this option. Moreover, the economies of OPEC nations are directly tied to oil exports. The price downturn of 1997-98 cost OPEC countries hundreds of billions of dollars in lost federal revenues and severely damaged their ability to meet their domestic demands for government services.

Moreover, the rebirth of Russian oil production could ultimately threaten OPEC cohesion. Even though Russia is currently sticking close to OPEC to sustain higher oil prices in the face of the recession, too much market manipulation on both the high end and low end, could result in OPEC's loss of coveted Western and Asian market share to the Russians. Saudi Arabia sufficiently values its relationship with the US that it sells its oil here for about $1 per barrel less than elsewhere, providing a direct benefit to American consumers of roughly $620 million per year.

I believe instead, that oil price spikes are the 21st century equivalent of 20th century oil embargoes – they cause significant economic dislocation, extreme tension between consuming and producing regions, and discourage investment in oil exploration and production and other critical infrastructure.

Oil is a global commodity. Generally, the only variables in the price of oil are transportation costs and quality – basically, there is a single world price for oil. In today's global marketplace, oil price spikes in one region equal oil price spikes in all regions – price isolation is virtually impossible regardless of how much oil an individual country produces. The UK, for example, is entirely oil self-sufficient – it nevertheless was the victim of nationwide strikes in the summer of 2000 when fuel prices hit record highs.

Developing effective responses to price volatility are more problematic than those to mitigate supply disruptions. Improved quality and transparency of oil data, more aggressive, market-driven management of strategic reserves, and a revised definition of "energy emergency" are actions that deserve serious consideration and review.

Finally, many oil policy objectives are technology driven. Investments in technologies to develop unconventional oil resources are critical for increasing US production. Reservoir characterization, enhanced oil recovery and extensive reservoir management – which rely on computational technologies, computer modeling, and visualization – are essential for maximizing oil production, as well as minimizing costs and environmental damage. It is critical that we invest in these technologies today if we are going to meet mid- and longer-term oil demand.

Developing Domestic Gas Resources

Let me turn very briefly to natural gas production and the importance of technology in meeting mid-term gas demand.

United States' annual natural gas consumption represents about one third of the world total. In light of September 11 and the constraints that oil places on our foreign policy, it seems prudent that we invest in enhancing domestic production of natural gas sufficient to meet dramatic increases in gas demand rather than encouraging imports. To do so, however, we will need to invest in cutting-edge technologies.

Two decades ago, it was the common wisdom that we would run out of natural gas by the end of the century; this fear prompted the passage of the Fuel Use Act which prohibited the use of natural gas for power generation. There were also warnings of huge jumps in the price of natural gas, as well as dire predictions about increasing reliance on imports.

That's not exactly how it has turned out. Production is up. The Fuel Use Act has been repealed. The US produces 84% of its gas domestically, and (exclusive of Canada) we import less than one percent of our gas in the form of LNG. Also, with the exception of the extreme price spikes last year, gas prices have remained relatively low.

These successes, in spite of the bleak scenario painted by analysts 30 years ago, are almost entirely technology driven. 3D seismic, hydraulic fracturing, directional drilling and coalbed methane production technologies were developed and deployed in the early to mid-90s. These and other technologies were the only option the industry had available to meet the supply challenge in the very low price environment of the time.

Domestic natural gas supply appears to be, once again, at a technology crossroads.

Between 1990 and 1999, the half lives of US gas wells -- the amount of time it takes for a well to produce at 50% of its initial rate -- shortened significantly. In 1990, the half-life of US gas wells in the Rocky Mountain region was 56 months; by 1999, it was only 24. Also, gas well depletion rates in the Outer Continental Shelf – the region which supplies us with the highest percentage of our natural gas – are increasing dramatically. Also cause for concern: Canadian production is exhibiting a similar profile.

In 1999, when I was Energy Secretary, the National Petroleum Council released its analysis of US natural gas supply. In its report, the NPC expressed confidence that the industry could supply 30 tcf market by 2015. This would however, depend in part on accelerated R&D investments in areas that are technically difficult to produce -- ultra-deepwater and onshore unconventional formations.

DOE then developed a technology roadmap for ultra-deepwater gas and oil production. The conclusion: the ultra-deepwater regions of the Gulf of Mexico likely contained significant gas reserves . . . major cost reductions in production would be required to make that gas marketable . . . and those price reductions would likely be achieved through a new architecture that moved production platforms from the ocean surface to the ocean floor.

Congress is poised to establish an R&D program to accomplish the vision of the roadmap. The House energy bill – HR 4 – authorizes an industry-led R&D program to develop both ultra-deepwater offshore and unconventional onshore natural gas and oil supply. The program would be sunsetted after seven years to ensure "ruthless execution" by industry participants for achieving the objectives of the legislation – helping to meet mid-term gas supply. It would be funded with 7.5% of royalties from production of oil and gas on federal lands. While 2001 was a good year for production and royalties paid to the government were higher than normal, the royalties collected that year would have funded the program at around $500 million. By way of comparison, the DOE gas supply R&D program has never exceeded $14 million a year.

The Senate energy bill, S 517, includes similar provisions. If this legislation becomes law, it will dwarf all previous federal oil and gas exploration and production R&D programs and provide opportunities and funding for precisely the type of technologies we are focusing on at this conference.

Estimates of the supply impacts of expanded R&D investments in unconventional onshore gas resources – tight gas sands, gas shales, advanced coalbed methane – could achieve levels equivalent to 25% of today's domestic production. Price/technology sensitivity modeling of the ultra-deepwater Gulf of Mexico suggests at least 4tcf per year of natural gas and a total of 32 billion barrels of oil.

The US already has a successful track record in unconventional gas R&D. Starting in 1982, a small R&D investment ($150 million with half matched by industry) resulted in an entirely new source of gas – coalbed methane -- which now supplies almost 7.5 % of our current domestic production. Most importantly, much of it comes from my home state of New Mexico!

US coalbed methane know-how has also had a global impact. China and Canada have started coalbed methane incentive programs. Development efforts are also underway in Central Europe, the United Kingdom, South America and Australia.

Reliable Power for the Digital Economy

All of the computational technologies now used in oil and gas development will be seriously devalued without the reliable, high quality power that is so essential to a modern economy. The frequent resets of VCRs and digital clocks offer the public an annoying manifestation of brief interruptions in power delivery or quality. Information-based businesses such as brokerages or, increasingly, energy producers, can tolerate only seconds of power interruption over the course of a year.

Last year there were two million interregional power transactions – a full order of magnitude greater than a decade earlier. These transactions occurred on a transmission system that is aging, outdated, and inadequate. One of the many factors that influenced California's recent flirtation with rolling blackouts, was long-standing congestion in the transmission system.

The reliability requirements of modern society are profoundly affected by moves to deregulate the electricity sector. To date, deregulation efforts have occurred on a state-by-state basis. This unevenness is problematic: electricity now flows long distances across large regions of the country but the "rules of the road" that govern this transmission are inconsistent from region to region.

Restructuring has already resulted in the unbundling of generation and transmission assets. Absent Federal direction however, the ownership and operation of transmission lines remain open questions. Adequate infrastructure is essential for reliable delivery of high quality power . . .investment is required to provide this infrastructure . . . uncertainty hampers investment . . . and the lack of Federal direction creates uncertainty.

I am encouraged by recent developments in the Senate. However, we will need to continue to invest in new technologies to help relieve congestion, expand the capacity of existing lines and improve power quality in order to meet new power requirements on timely basis.

I highlight these as issues of growing concern to the oil and gas industry. The industry's increasing financial and operational dependence on computation and reliable, high quality power means that without it, American consumers will likely pay higher prices at the gas pump, as well as more money to flip on the light switch.

What About the Future?

It's always dangerous to prognosticate about energy markets but the NYMEX is no longer responding to what I say – so it's safe to make a few predictions.

OPEC's strategy to keep world oil prices at its desired level – around $24 today -- has been successful. Non-OPEC oil producing countries have been beneficiaries of this strategy as well and will likely continue to work closely with OPEC to sustain price levels. The Saudis must be especially pleased with Russian adherence to production agreements.

Most analysts say that the recent $3 per barrel price increase is already the "war premium" we are paying for a likely confrontation with Iraq. While this may be true, it may also be a reflection of relatively strict adherence to OPEC production quotas (86% compliance in the last two months compared to 76% for the previous year), Iraq's production cuts in response to US/UK efforts to tighten sanctions, and seasonal inventory drops. Absent an all-out war against Iraq, oil will probably drop slightly by the end of the year, even with an economic recovery.

There is a reasonable concern that, given the strong signals about taking out Sadam Hussein, he might elect to strike first. This was his pattern in the 1980 war against Iran, as well as his 1990 invasion of Kuwait.

Natural gas prices will likely move into the low end of the $3-$4 per mcf range for the next couple of years. This price is insufficient for the unsubsidized construction of the Alaska gas pipeline, which has a clearing price of around $3.80 per mcf. This price is sufficient, however, to attract more LNG imports, depending on transportation distances.

In the longer term, we should expect increased domestic gas and oil production in the deepwater, which currently accounts for almost 20% of our daily gas consumption. Coalbed methane consumption, while a small fraction of the US total, will be important at the margins, and efforts will intensify to economically produce the estimated 15 tcf of US coalbed methane reserves. Development of both of these regions will require increased investments in R&D.

Finally, I believe that the Congress will ultimately pass, and the President will sign, a comprehensive energy bill this year. Both need to deliver an energy plan to their constituencies going into election season this fall. Most importantly, however, the country needs a new, robust energy policy to help meet the growing energy needs of the 21st century – and I think the Congress will do the right thing and pass an energy bill.

Thank you very much for inviting me to speak to you today and I look forward to hearing from the rest of the participants.